CASE STUDY: **battery park city community ball fields**

Stantec Sport

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Experts on the Field, Partners in the Game.

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AGENDA

- Describe the Exiting Conditions
- Review Clients Program and Sustainability Mandate
- Review the ‘Most Sustainable Turf System’
    - Review a typical synthetic turf system components and the way these systems ‘work’
    - Review of the Life Cycle Analysis - the “Most Sustainable” Turf System
- Review of Site Specific Sustainability Initiatives
    - Stormwater Management with Multi-media Filters
    - Lighting Fixture Replacement
    - Consensus on PVs and Wind Turbines

Location

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Existing Conditions

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Existing Conditions

Existing Conditions

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Existing Conditions

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Program and Sustainability Mandate

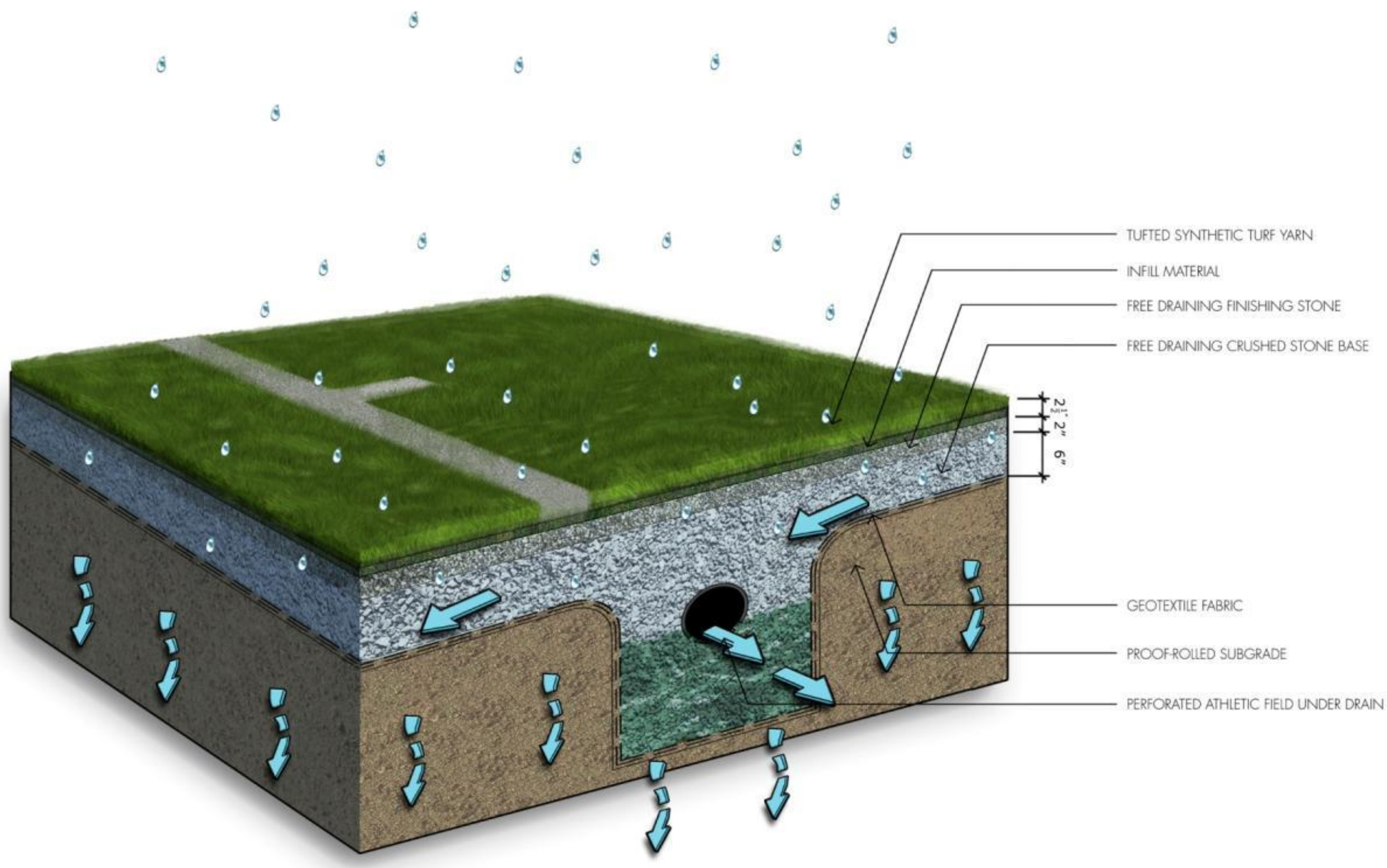
TURF SYSTEM COMPONENTS

- Identification and presentation of alternative and more sustainable turf alternatives and their advantages and disadvantages
- Removal of potentially hazardous materials in the turf system
- Identification of a recyclable product(s) upon removal at end of field useful life
- Address heat build-up. How to reduce heat build-up and/or mitigate impacts? Based on Provide a system that effectively filters rain and run-off

SITE SPECIFIC STORMWATER IMPACTS

- Stormwater impacts: address quality and quantity of run-off
- Potential for stormwater collection and re-use
- Integration of water treatment and potential for re-use on site

Typical Synthetic Turf System



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Synthetic Turf System Components

Fiber – Traditional Slit Film

Infill – Organic

Infill – Recycled SBR

Fiber – Parallel Slit Film

Infill – TPE

Infill – Sand(s)

Fiber – Monofilament - Spine

Pad – Panel/Roll

Pad – E-Layer

Fiber – Monofilament - Shape

Backing – PP & PE

Backing – PP & PU

Synthetic Turf System Components / Life Cycle Analysis

SYNTHETIC TURF SYSTEM COMPONENTS

	Component	*General Description*	*Manufacturer Example**	*Manufacturing Location*	*Manufacturer's Website*
	CARPET				
FIBER	2.5" Height	Polyethylene carpet fibers standing 2.5" high, infilled 1.75"	A-Turf	Dalton, GA	www.aturf.com
FIBER	1.5" Height	Polyethylene carpet fibers standing 1.5" high, infilled 0.75"	A-Turf	Dalton, GA	www.aturf.com
FIBER	w/thatch layer	Polyethylene carpet fibers with 1.5"-2.5" with nylon "rootzone" or "thatch layer", can help to reduce infill splash	AstroTurf (Gameday Grass)	Dalton, GA	http://www.astroturfusa.com/product/gameday-grass.html
FIBER	No Infill - PE	Polyethylene carpet fibers approx. 1" high, densely tufted so no infill is needed	A-Turf (SportTurf-Cushion)	Dalton, GA	http://www.aturf.com/index.php/artificial-turf-specifications/
FIBER	No Infill - Nylon	Nylon carpet fibers tufted together to form a "mat" - typically very abrasive	AstroTurf (AstroTurf 12)	Dalton, GA	http://www.astroturfusa.com/product/astroturf12.html
BACKING	Primary	The backing which the synthetic turf fibers are tufted through which gives the carpet strength and stability	Royal Ten Cate	Dayton, TN	www.tencate.com
BACKING	Secondary	A coating over the primary backing which essentially "glues" the fibers to the backing thereby further increasing carpet strength and stability	Universal Textile Technologies / Dow Chemical	Dalton, GA	www.universal-textile.net
	INFILL				
RUBBER	SBR	A recycled rubber typically derived from passenger and/or truck tires	Target Technologies International Inc.	Burnaby, BC, Canada	http://www.ttiionline.com/ambient_crumb_rubber.htm
RUBBER	Coated SBR	SBR rubber coated with pigmented polyurethane			
RUBBER	EPDM	A recycled rubber derived from off-cuts of production lines making it a "virgin" rubber	Target Technologies International Inc.	Burnaby, BC, Canada	http://www.ttiionline.com/epdm_crumb_rubber.htm
RUBBER	TPE	Granules are made from thermoplastic elastomers creating a true virgin rubber	Polytan USA	Marietta, GA	www.polytan-usa.com/sports_surfaces_infill_materials_polytan.php
SAND	Sand - Silica (20-40 mesh)	A round, smooth, uniform sand, without angular pieces to reduce any potential infill compaction	Target Technologies International Inc.	Burnaby, BC, Canada	http://www.ttiionline.com/silica_sand.htm
SAND	Sand - Flexsand	An elastomer coated sand to provide a firm yet flexible infill	Mineral Visions, Inc.	Chardon, Ohio	http://www.ttiionline.com/flex_sand.htm
SAND	Sand - Local/Native	Typically angular "beach" type sand, angularity can promote infill compaction	Fairmount Minerals	OH, MI, WI, TX	www.fairmountminerals.com
COCONUT	Coconut Fiber w Sand	A pre-mixed infill blend of coconut fibers and sand	Italgreen	Italy	www.italgreen.it
COCONUT	Coconut Fiber w Sand & Coated Rubber	A pre-mixed infill blend of coconut fibers, sand and a coated rubber	Italgreen	Italy	www.italgreen.it
COCONUT	Coconut Fiber w Cork	A pre-mixed infill blend of coconut fibers and cork	Geo Turf by Limonta Sport USA	Italy / New York, NY	http://www.geosafeplay.com/infill-geo.aspx
	UNDERLAYMENT				
PADDING	E-layer (CIP Rubber)	A paved-in-place mat consisting of SBR rubber and a binding agent or "glue"	Ecore International (Rubber)	Lancaster, PA	www.ecoreintl.com
PADDING	Pre-fab Pad (Rubber Roll)	A pre-fabricated rubber mat which can be loose laid on a subgrade	Regupol America	Lebanon, PA	http://www.regupol.com/turf.html
PADDING	Brock (panel)	A pre-fabricated panel which interconnects with adjacent panels on top of the subgrade - no additional attachments methods are necessary	Brock International	Boulder, CO	www.brock-international.com

Life Cycle Analysis

Life Cycle Stages for an Artificial Turf System

Manufacturing of Turf Components → Transport of Turf Components → Installation of Turf Components → Field Maintenance and Performance → End of Life / Replacement of Components

At each life cycle stage, resources are consumed, emissions are released to air and water, and wastes are produced, resulting in a range of environmental impacts.

Life Cycle Analysis

Sustainability Criteria Considered for Turf System Design

Life Cycle Stage	Sustainability Criteria
Manufacturing of Turf Components	Energy required for resource extraction and processing
	Amount of non-renewable resource inputs
	Amount of recycled or reused materials
	Use of hazardous raw materials
Transport of Turf Components	Distance transported from manufacturer to project site
	Efficiency of transport mode
	Mass of material to be transported
	Amount of packaging required for transport to project site
Installation of Turf Components	Amount of excavation required
	Amount of aggregate/stone infill required
	Energy required to operate machinery
	Waste management options
Field Maintenance and Performance	Meets the functional requirements for intended use
	Exposure to toxic materials
	Energy required for maintenance activities
	Water required for cleaning and cooling
	Life span
End of Life / Component Replacement	Ability to reuse the materials
	Ability to recycle the materials
	Amount of material that must be placed in landfill
	Risk of toxicity in landfill

Life Cycle Analysis - Turf Fiber

Sustainability Comparison - Carpet Fiber

Most Sustainable Option: 1.5" Polyethylene Fibers

Overall Rationale: The lower pile height means that less polyethylene is required per square yard of field. This reduces energy consumption and raw material use at the manufacture stage, slightly reduces transportation impacts, and reduces the amount of materials that must be recycled or landfilled at end-of-life. This carpet also requires less infill than the 2.5" fiber carpet, which also reduces energy consumption and at the infill manufacturing stage and reduces the amount of infill that must be transported to the site, and ultimately the amount of infill material that must be recycled or landfilled at end-of-life. Field performance and maintenance is assumed to be equivalent or superior to the other carpet fibers considered in the analysis, including life span

Criteria Rankings

1 = least sustainable option
2
3
4
5 = most sustainable option

		2.5" Polyethylene Fibers	1.5" Polyethylene Fibers	2.5" Polyethylene with Thatch Layer	No Infill Polyethylene	No Infill Nylon
Life Cycle Stage	**Sustainability Criteria**	**Score**	**Score**	**Score**	**Score**	**Score**
Manufacturing of Turf Components	Energy required for resource extraction and processing	3	4	2	3	1
	Amount of non-renewable resource inputs	2	3	1	4	4
	Amount of recycled or reused inputs	2	2	2	2	2
Manufacturing Total		**7**	**9**	**5**	**9**	**7**
Transport of Turf Components	Distance transported from manufacturer to site	3	3	3	3	3
	Efficiency of transport mode	2	2	2	2	2
	Amount of packaging required to be transported	3	4	2	4	4
	Mass of material to be transported	2	3	2	4	4
Transport Total		**10**	**12**	**9**	**13**	**13**
Installation of Turf Components	Amount of excavation required	3	3	3	3	3
	Amount of aggregate/stone fill required	3	3	3	3	3
	Waste management options	4	4	1	1	1
	Energy required to operate machinery	3	3	3	4	4
Installation Total		**13**	**13**	**10**	**11**	**11**
Field Maintenance and Performance	Meets the functional requirements for intended use	5	5	5	1	1
	Risk of exposure to toxic materials	4	4	4	4	4
	Energy required for maintenance activities	3	3	3	3	3
	Water required for cleaning and cooling	3	3	3	3	3
	Life Span	4	5	4	2	2
Maintenance and Performance Total		**19**	**20**	**19**	**13**	**13**
End of Life / Component Replacement	Ability to reuse the materials	2	2	2	2	2
	Ability to recycle the materials	3	3	2	3	3
	Risk of toxicity in landfill	2	2	2	2	2
	Amount of material that must go to landfill	2	3	1	4	4
End of Life Total		**9**	**10**	**7**	**11**	**11**
Total Score		**58**	**64**	**50**	**57**	**55**

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Life Cycle Analysis – Sand Infill

Sustainability Assessment - Sand Infill

Most Sustainable Option: Sand Local/Native

Overall Rationale: It is assumed that extraction processes are the same for both types of sand, and that installation, performance, maintenance, and end of life options are essentially the same. The differentiating factor for the local sand is that it is produced closer to the proposed project site and as a result, environmental impacts associated with transport of freight by truck (greenhouse gas emissions, criteria air contaminant emissions, fossil fuel consumption) are reduced relative to non-local sand option.

Relative Rankings

1 = least sustainable option
2
3 = general standard
4
5 = most sustainable option

Life Cycle Stage	Sustainability Criteria	Sand - Silica (20-40 mesh) Score	Sand - Local/Native Score
Manufacturing of Turf Components	Energy required for resource extraction and processing	3	3
	Amount of non-renewable resource inputs	2	2
	Amount of recycled or reused materials	1	1
Manufacturing Total		**6**	**6**
Transport of Turf Components	Distance transported from manufacturer to site	2	4
	Efficiency of transport mode	2	2
	Amount of packaging required to be transported	3	3
	Mass of material to be transported	3	3
Transport Total		**10**	**12**
Installation of Turf Components	Amount of excavation required	3	3
	Amount of aggregate/stone fill required	3	3
	Waste management options	3	3
	Energy required to operate machinery	3	3
Installation Total		**12**	**12**
Field Maintenance and Performance	Meets the functional requirements for intended use	5	5
	Risk of exposure to toxic materials	1	1
	Energy required for maintenance activities	3	3
	Water required for cleaning and cooling	3	3
	Life Span	4	4
Maintenance and Performance Total		**16**	**16**
End of Life / Component Replacement	Ability to reuse the materials	2	2
	Ability to recycle the materials	2	2
	Risk of toxicity in landfill	1	1
	Amount of material that must go to landfill	2	2
End of Life Total		**7**	**7**
Total Score		**51**	**53**

Life Cycle Analysis - Infill

Sustainability Comparison - Infill

Most Sustainable Option: Coconut Fiber and Sand

Overall Rationale: The coconut component of this infill is made from all natural, pre-consumer recycled fibers, which provides advantages over the other infill types in energy intensity of manufacturing, use of non-renewable resources, and amount of recycled material inputs. One weakness of the coconut-sand infill is that coconut fibers are shipped from India to Italy for manufacturing, and the overall manufactured product is shipped to the U.S. from Italy; however, over 90% of this shipping is by ocean freighter, which is the most efficient form of freight transportation. This infill has a distinct sustainability advantage at the end of life stage, as the material is all-natural, more recyclable, and less likely to go to landfill

Relative Rankings

1 = least sustainable option
2
3 = general standard
4
5 = most sustainable option

Life Cycle Stage	Sustainability Criteria	50% Sand / 50% SBR Score	Cocunut Fiber and Sand Score	FlexSand Score	80% TPE / 20% Sand Score
Manufacturing of Turf Components	Energy required for resource extraction and processing	3	4	2	1
	Amount of non-renewable resource inputs	3	4	1	1
	Amount of recycled or reused materials	3	4	1	1
Manufacturing Total		**9**	**12**	**4**	**3**
Transport of Turf Components	Distance transported from manufacturer to site	3	1	3	4
	Efficiency of transport mode	2	4	2	2
	Amount of packaging required to be transported	3	2	3	3
	Mass of material to be transported	3	3	3	3
Transport Total		**11**	**10**	**11**	**12**
Installation of Turf Components	Amount of excavation required	3	3	3	3
	Amount of aggregate/stone fill required	3	3	3	3
	Waste management options	3	3	3	3
	Energy required to operate machinery	3	3	3	3
Installation Total		**12**	**12**	**12**	**12**
Field Maintenance and Performance	Meets the functional requirements for intended use	5	5	5	5
	Risk of exposure to toxic materials	2	5	3	4
	Energy required for maintenance activities	3	3	3	4
	Water required for cleaning and cooling	2	3	4	4
	Life Span	4	4	4	4
Maintenance and Performance Total		**16**	**20**	**19**	**21**
End of Life / Component Replacement	Ability to reuse the materials	2	4	2	2
	Ability to recycle the materials	2	4	2	4
	Risk of toxicity in landfill	3	4	3	4
	Amount of material that must go to landfill	3	4	3	3
End of Life Total		**10**	**16**	**10**	**13**
Total Score		**58**	**70**	**56**	**61**

Life Cycle Analysis – Pad or Underlayment

Sustainability Comparison - Underlayment

Most Sustainable Option: Brock Panel

Overall Rationale: The Brock Panel and Rubber Roll are relatively comparable in terms of the sustainability criteria considered in this analysis. The disadvantage of the Brock Panel is that it is manufactured from virgin polypropylene, whereas the other two underlay options are made primarily from recycled materials. Two distinct sustainability advantages for the Brock Panel are in the transportation stage, where the lighter weight of the product and the more compact packaging style can improve transport efficiencies relative to the other two options, and at the end of life stage, because the manufacturer will take the product back and recycle it when the useful life is complete.

Relative Rankings

1 = least sustainable option
2
3
4
5 = most sustainable option

		E-Layer	Rubber Roll	Brock Panel
Life Cycle Stage	**Sustainability Criteria**	**Score**	**Score**	**Score**
Manufacturing of Turf Components	Energy required for resource extraction and processing	2	4	1
	Amount of non-renewable resource inputs	2	4	1
	Amount of recycled or reused materials	3	4	1
Manufacturing Total		**7**	**12**	**3**
Transport of Turf Components	Distance transported from manufacturer to site	3	3	2
	Efficiency of transport mode	2	2	2
	Amount of packaging required to be transported	2	2	4
	Mass of material to be transported	1	2	4
Transport Total		**8**	**9**	**12**
Installation of Turf Components	Amount of excavation required	3	3	3
	Amount of aggregate/stone fill required	3	3	3
	Waste management options	3	3	3
	Energy required to operate machinery	2	3	4
Installation Total		**11**	**12**	**13**
Field Maintenance and Performance	Meets the functional requirements for intended use	5	5	5
	Risk of exposure to toxic materials	2	2	3
	Energy required for maintenance activities	3	3	3
	Water required for cleaning and cooling	3	3	3
	Life Span	4	4	4
Maintenance and Performance Total		**17**	**17**	**18**
End of Life / Component Replacement	Ability to reuse the materials	1	4	4
	Ability to recycle the materials	1	3	5
	Risk of toxicity in landfill	2	2	4
	Amount of material that must go to landfill	1	2	4
End of Life Total		**5**	**11**	**17**
Total Score		**48**	**61**	**63**

Life Cycle Analysis – System

Underlayment

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Turf Temperatures

Site Specific – Existing Plan

Site Specific – Proposed Plan

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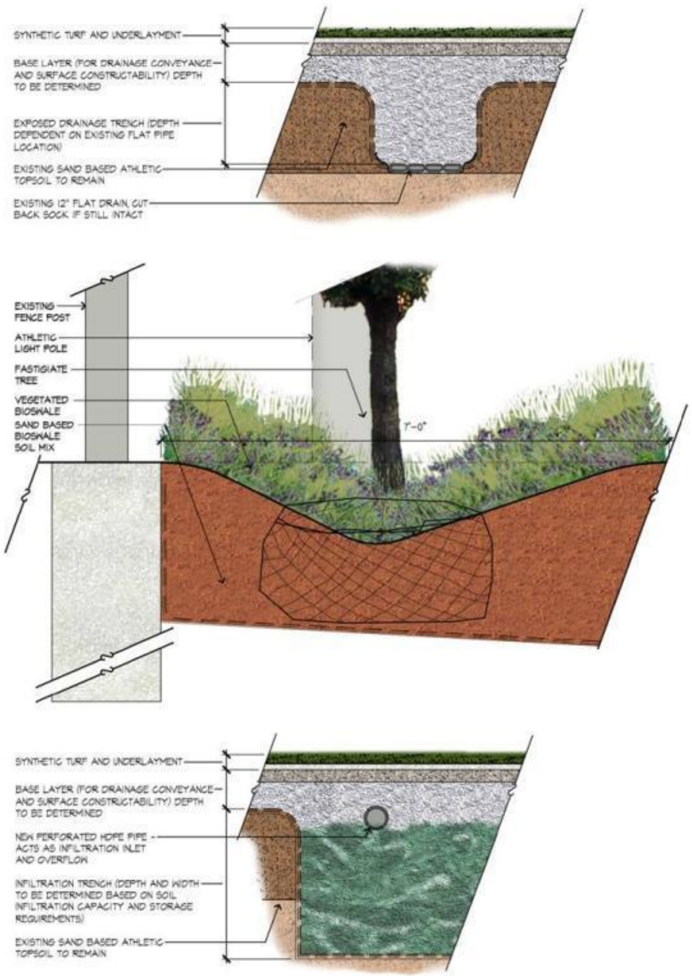
Site Specific – Base & Drainage; Existing & Proposed



Existing Conditions
Proposed Infiltration and Overflow
Proposed Conditions with Irrigation Tank

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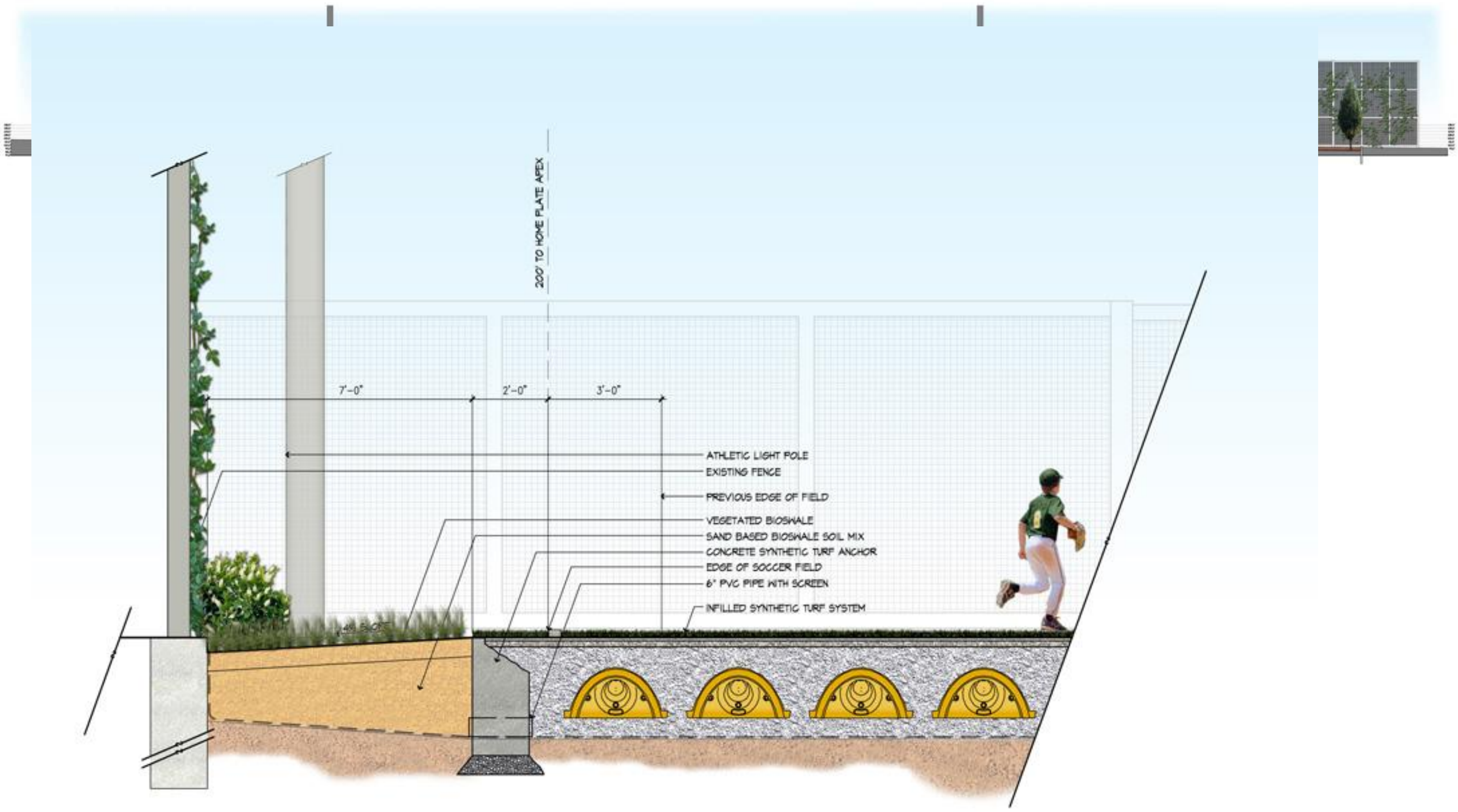
Site Specific – Filter & Storage



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Construction

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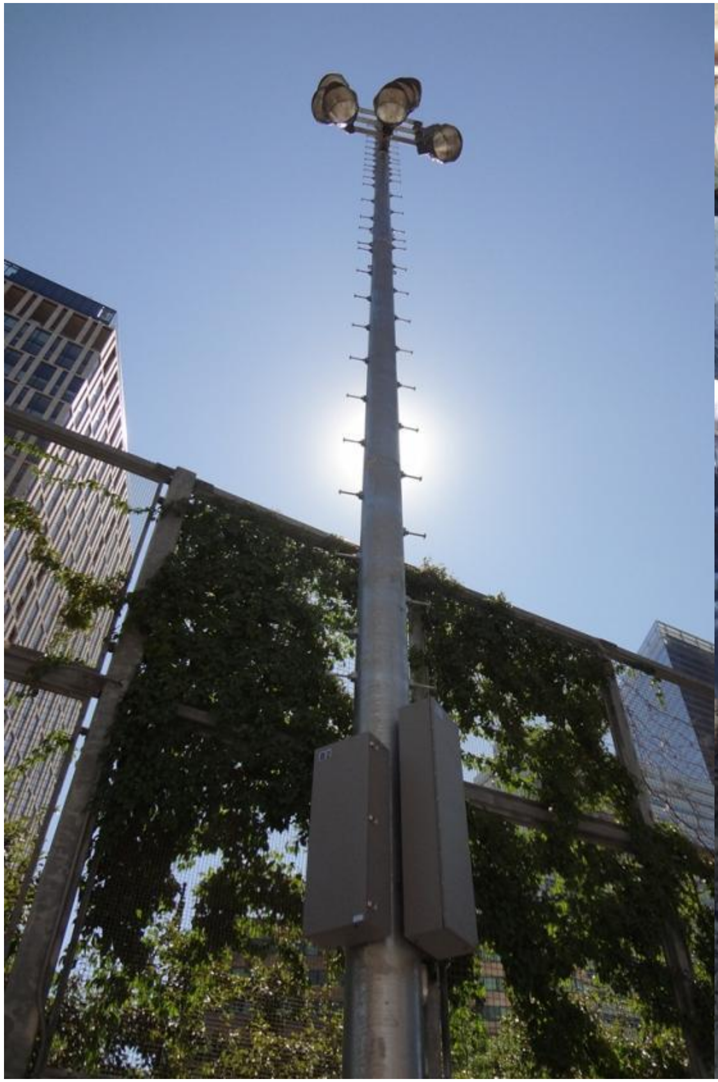

Construction

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Construction

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Open for Soccer

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Open for Soccer

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Open for Soccer

community ball fields

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Synthetic Turf Toxicological Review - Human Health & Environmental

- LITERATURE REVIEW
- Task objective - Review and evaluate the available literature to determine if there is the potential for risk of harm to human health and/or the environment as related to exposure to synthetic turf.
- 3 phase method was used :
    - Tier I : search
    - Tier II: screening
    - Tier III: thorough evaluation
- Our findings were similar to the reports by CPSC and EPA, which suggest no human health or environmental concern with the crumb rubber infill material, but does not take into account heat or filtration.

Sports Lighting Upgrade

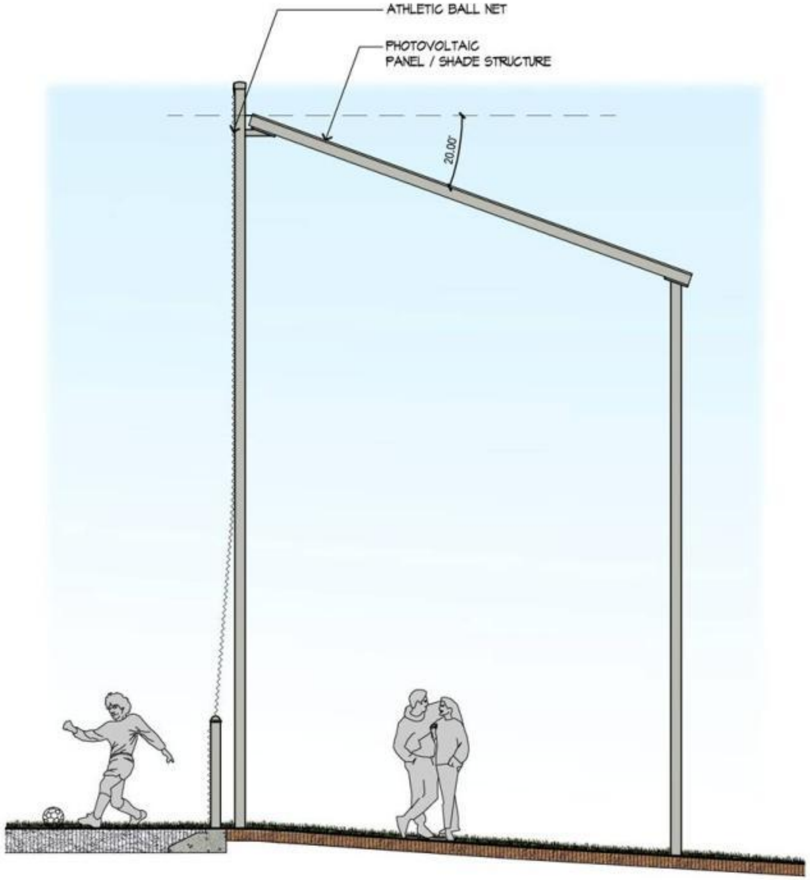
Positive of Fixture Replacement

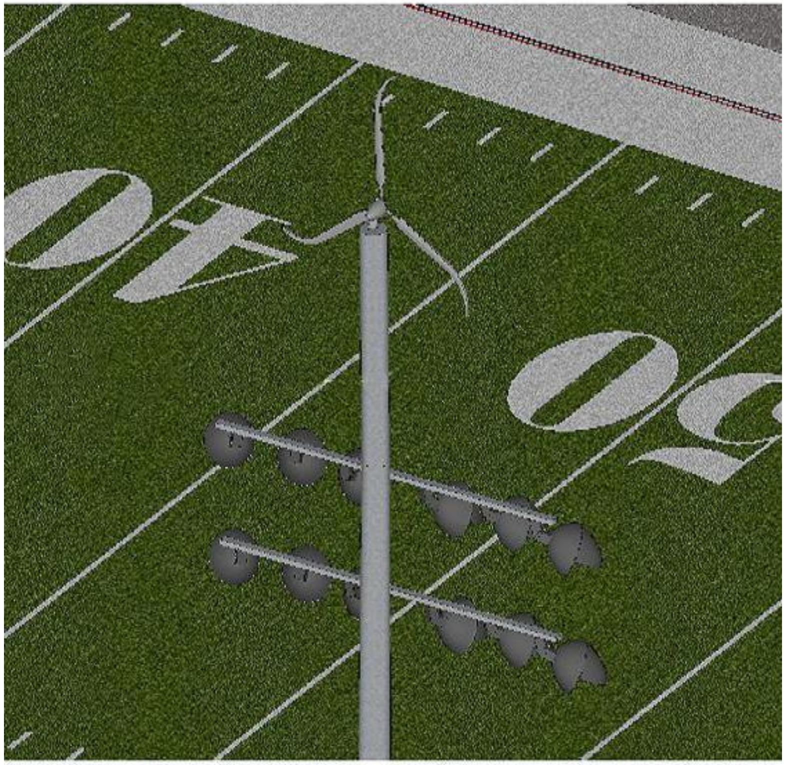
- Energy Consumption Reduced Over 50%
- Light Quality Improved
- Angle and Spill Control Improved
- Controls for Each Field and Ice Rink; Saving More Energy of the Existing System

Negatives

- Cost – Installed Estimated Quote $145,000 -$160,000

Consensus on Photovoltaic and Wind Turbines





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